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भारतीय मानक

बल्क प्रहस्तन उपस्कर–स्टैकर (रेल आरोपित)

भाग 1 सामान्य अपेक्षाएँ

Indian Standard

BULK HANDLING EQUIPMENT—STACKER (RAIL MOUNTED)

PART 1 GENERAL REQUIREMENTS

ICS 53.040.01

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

August 2003

Price Group 2

Bulk Handling Systems and Equipment Sectional Committee, ME 07

FOREWORD

This Indian Standard (Part 1) was adopted by the Bureau of Indian Standards, after the draft finalized by the Bulk Handling Systems and Equipment Sectional Committee had been approved by the Mechanical Engineering Division Council.

There is always bulk demand of raw materials in steel, power, fertilizer, cement and other industries and the stock yards play a vital role in material handling field.

To optimize the process of storing, distribution and homogenizing, various types of stackers may be employed to suit the conditions.

From the mining to the processing of bulk materials, importance of intermediate stockpiles, reserve stockpiles and blending beds are significant. Depending on needs, stackers may be designed to stack linear piles of trapezoidal and triangular cross-sections arranged parallel in storage yards. Also conical piles of same/different material may be stacked in the yard. In special cases, a single stacker may be used to serve several parallel piles by transferring the stacking machine from one stockpile bed to other through transfer car arrangement. To cater for these different functions and end uses, various types of rail mounted stackers may be used.

A number of different design concepts may be developed for stacking process. The design and selection of various types may be influenced by different operating requirements of the individual stockyard applications.

Function, performance and efficiency of stackers greatly depends upon proper use of the machine. It is therefore, recommended that the machine should be operated and maintained by end user in accordance with the set of norms prescribed by manufacturer in the operation and maintenance manual(s).

This standard is published in three parts. Other parts of this standard are:

Part 2 Data to be furnished by the purchaser

Part 3 Data to be furnished by the manufacturer/supplier

The formulation of the present standard is with a view to provide guidelines for adoption of uniform approach by the purchaser and the manufacturer/supplier.

For structural requirements of stacker (rail mounted) a reference may be made to IS 13148 (Part 1): 1999 'Mobile equipment for continuous handling to bulk materials : Part 1 Rules for design of structure (*first revision*)'.

In the preparation of this standard, assistance has been made from the following:

BS 2452 : 1954 'Specification for electrically driven jib cranes mounted on a high pedestal or portal carriage (high pedestal or portal jib cranes)' issued by the British Standards Institution.

ISO 5049-1 : 1994 'Mobile equipment for continuous handling of bulk Materials—Part 1: Rules for design of steel structures'.

Indian Standard
BULK HANDLING EQUIPMENT—STACKER (RAIL MOUNTED)
PART 1 GENERAL REQUIREMENTS

1 SCOPE

This standard (Part 1) covers general requirements for various types of rail mounted mobile stackers used as bulk handling equipment. This standard does not cover the rail mounted combined stacker cum re-claimer.

2 REFERENCES

The standards listed in Annex A contain provisions which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated in Annex A.

3 TYPES

Generally the following types of stackers are used:

a) *Twin boom non-slewing type*
   1) Twin boom non-luffing stacker;
   2) Twin boom luffing stacker-with hydraulic or rope luffing arrangement

b) *Single boom type*
   1) Single fixed boom stacker;
   2) Single luffing boom stacker-with hydraulic or rope luffing arrangements;
   3) Single slewing boom stacker; and
   4) Single slewing and luffing boom stacker-with hydraulic or rope luffing arrangements.

4 DESIGN AND SELECTION CRITERIA

The following factors may be considered:

a) Availability and type of land for stockyard;
b) Climatic and environmental conditions;
c) Handling rates and characteristics of the materials to be stacked;
d) General purpose of the stockyard;
e) Need for automation;
f) Type of operations before and after the stockyard;
g) Blending of material, if applicable;
h) Dust control system;
j) Power supply system; and
k) Earthing system.

5 GENERAL PARAMETERS

5.1 Tracks

a) *Rail sizes:* Usually rails adopted shall be: 30 kg/m, 45 kg/m, 52 kg/m, CR-80, CR-100;
b) *Rail centres/gauges:* Usually the gauges adopted shall be: 4.5, 5, 5.5, 6, 6.5, 7, 7.5, 8, 8.5, 9, 9.5 and 10 m;
c) *Track foundation:* Foundation shall be to suit the soil conditions.

   However in special cases, this may be decided mutually between the purchaser and the manufacturer based on soil condition;
d) *Wheel loads:* Up to (30 000 in kg) per wheel (vertical down ward); and
e) *Impact factor :* Minimum impact factor shall be 10 percent.

5.2 Boom Belt Width

Usually boom belt width shall be as per IS 1891 (Parts 1 to 5).

5.3 Boom Out Reach

5.3.1 *Boom Out Reaches*

It is the distance between the track centre and centre of the boom conveyor discharge pulley.

5.3.2 *Boom Out Reach (Lengths)*

Boom length shall be 18, 21, 25, 28, 30, 35, 40 and 50 m. However, other length can be used as per the agreement with user and manufacturer.

5.4 Boom Luffing Range

Maximum luffing range adopted in operation shall be decided on the basis of boom hinge location, pile height, type of material, etc.

5.5 Boom Slewing Range

Usually boom slewing range during the operation with respect to track centre shall be ± 105°.

6 DRIVE ARRANGEMENT

6.1 Long Travel Drive

Travel drive shall be generally of single wheel drive (for 2 wheels per corner) or tandem wheel drive (for more than 2 wheels per corner) on both sides of the machine. Out of total number of long travel wheels, minimum 50 percent shall be driving wheels under the main machine.

6.1.1 *Single Wheel Drive*

It shall consist of hollow shaft mounted gear box or gear reducer directly coupled to wheel axle and connected with electric ac/dc motor through flexible coupling.

6.1.2 *Tandem Drive*

It shall consist of hollow shaft mounted gear box connected with ac motor and/or dc motor through flexible coupling. Two wheels shall be coupled through set of gears.

6.2 Boom Hoist/Boom Luffing Drive

Hoist/Luffing drive shall generally be of winch rope type or hydraulic cylinder type.

6.3 Boom Conveyor Drive

Conveyor drive shall be through hollow shaft mounted or solid shaft gear reducer coupled with electric motor or drum drive. Drive arrangement may be provided at the tail end of the conveyor.

6.4 Slewing Drive

Slewing drive shall be applicable in case of slewing boom type stacker. The slewing bearing with external or internal gear rim integral with slewing bearing or separate shall be mounted in between turntable and stationary carriage/gantry with gear rim in mesh with pinion(s). On pinion shaft, hollow or solid shaft gear reducer(s) shall be mounted which is coupled with electric ac or dc motor or ac VVFC drive (variable voltage frequency converter). The pinion shaft shall have backlash adjustment provision. Slewing drive may also be through hydraulic motor. The slewing axis shall coincide with the centreline of stacker.

6.5 Operator's Cabin

The machine shall be operated from a cabin suitably located to allow full view of the operating area. This shall have shatterproof glass window, windscreen wipers, adjustable seat, adequate lighting, fans, etc. Pressurized air ventilation and air conditioning of the cabin may also be provided (if asked by the purchaser).

7 SAFETY REGULATION

7.1 Against Drifting

Normally 2 to 4 numbers manual or automatic rail clamps of adequate clamping force shall be fitted to prevent the machine from drifting in non-operating/stormy condition. The manual/automatic rail clamps shall be inter-locked with long travel drive. For safety of the equipment, that is the indicating lamps shall be provided to know whether the equipment is under locking condition or not and the machine should not start unless the clamps are released. Operation of automatic rail clamp shall be controlled by anemometer provided on the machine.

7.2 Over-Travelling Switches and End Buffers

Set of over travelling limit switches and end buffers at both ends of travel zone shall be provided to prevent possibility of overrunning of the machine. End buffers on long travel bogies and travel-end to be provided for arresting the motion in case of failure of the safety system.

7.3 Limit Switch for Hoisting/Luffing

Limit switch for luffing shall be provided to restrict the luffing range from maximum inclination to maximum declination.

7.4 Probe Switch

Probe sensors shall be provided at the boom part of the boom head end to prevent the boom touching and consequential burial of head end into the stockpile material, by providing signal to luff-up the boom as the pile height increases with more discharge of material into the pile.

7.5 Anti-Collision Switch

Such switches shall be provided on both sides of the boom to prevent accidental hitting of the boom with the pile-top while slewing, if agreed between the purchaser and the supplier.

7.6 Belt sway switch, pull cord switch and zero speed switch on boom belt conveyor shall be provided.

7.7 Safety chain for boom luffing may be provided if agreed between the purchaser and the manufacturer.

7.8 Anchorage

Boom or entire machine shall be anchored with ground preferably at parking zone. Provision shall be kept to lock the slewing part of the machine with fixed part while the machine is not operating so that there is absolutely no movement of boom in any direction (applicable to slewing stackers only).

7.9 Anemometer

Anemometer shall be installed on top most part of the machine to give the signal/indication of non-operating condition of the machine and stop all operations of the machine in case of high wind velocity as per IS 555 when checked.

7.10 Stability of Machine

7.10.1 A minimum of stability factor of machine during operating condition without operating wind shall be kept as 1.5 [*see* IS 4988 (Parts 1 to 5)].

7.10.2 A minimum of stability factor during non-operating condition with high wind velocity shall be kept as 1.20 [*see* IS 4988 (Parts 1 to 5)].

7.10.3 A minimum of stability factor of machine during operating condition with operating wind shall be kept as 1.3.

7.11 Limit Switch

A set of limit switches for slewing shall be provided to prevent over slewing+1X of the boom, +2X in both directions of rotation of the machine.

7.12 Switches for Hydraulic System

High pressure and low pressure switches shall be provided in hydraulic system, if agreed between the purchaser and the manufaturer.

ANNEX A

(*Clause* 2)

LIST OF REFERRED INDIAN STANDARDS

IS No.	*Title*
555 : 1979	Specification for electric table type fans regulators (*third revision*)
1891	Conveyor and elevator textile belting — Specification:
(Part 1) : 1994	General purpose belting (*fourth revision*)
(Part 2) : 1993	Heat resistant belting (*fourth revision*)
(Part 3) : 1988	Oil resistant belting (*second revision*)
(Part 4) : 1994	Hygienic belting (*first revision*)
(Part 5) : 1993	Fire resistant belting for surface application
4988	Glossary of terms and classifi-cation of earth moving machinery:
(Part 1) : 1969	General terms
(Part 2) : 1968	Dozers
(Part 3) : 1968	Motor and towed scrappers
(Part 4) : 1968	Excavators
(Part 5) : 1968	Motor graders

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